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TECHNICAL NOTE

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A BARRIER PANEL TO PREVENT THE UPSTREAM MIGRATION OF FISH

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I. Introduction

The use of barrier dams to prevent undesirable fish from gaining access to reclaimed or otherwise protected waters is an integral part of reclamation programs. This is especially true in programs dealing with rare and endangered fishes.

Barriers should not only provide an adequate vertical drop, but should also include a device to disperse overflowing water to impede the formation of a pool or submerged wave below the barrier. Such a device is described for relatively constant flow or spring fed streams.

II. Background

The Owens pupfish, Cyprinodon radiosus, was once widely distributed in the Owens Valley along the eastern base of the Sierra Nevada Range in California. With the establishment of exotic fishes in the valley and the marked reduction of marshy areas due to the removal of much of the water through the Los Angeles Aqueduct (Heinly, 1910), the pupfish population rapidly declined.

The pupfish did survive, however, in the wide, flat, reedy, warm spring basins of Fish Slough, ten miles north of Bishop, California. A check of the Slough in 1937 revealed only carp, Cyprinus carpio, and largemouth bass, Micropterus salmoides, along with a few minnows and suckers, in the southern and middle parts. A small population of pupfish was present in the northernmost springs. In September, 1942, no pupfish could be found. Their rapid disappearance was attributed to direct predation by largemouth bass (Miller and Pister, 1971). When described in 1948, Cyprinodon radiosus was thought to be extinct.

When a small population was rediscovered in 1964, plans were made to establish the Owens Valley Native Fish Sanctuary in Fish Slough. Approval for the Sanctuary was granted by the California Fish and Game Commission in April, 1968.

In August, 1969, an introduction of 400 pupfish was made into "BLM Spring" on the east side of Fish Slough. This site was chemically treated with calcium hypochlorite (Commercial HTH) to remove the resident populations

of carp, largemouth bass, and mosquitofish, Gambusia affinis. Three gravel percolator barriers were placed in the stream channel leading out of the spring to prevent the upstream movement of undesirable species. Enough mosquitofish survived the treatment that by May of 1970 a new population was in competition with the pupfish. The sanctuary was again treated with HTH in the shoals and rotenone in the deeper parts.

With the reappearance of unwanted fish in the spring of 1972, the upstream gravel barrier was rebuilt to a panel type, somewhat modified from a design suggested by Flick (1968).

III. Panel Size and Construction

While it may be necessary to vary the panel size with the size of the stream, the design remains the same. A 3 x 4 foot panel is adequate for most small and constant flow waters and is easy to construct (Figure 1).

A frame is constructed from 2 x 6 inch redwood with 90° angle baffles (each side of an angle 4 inches) of 16 guage galvanized tin placed 1 inch apart and routed-in at each end.

The cost of the panel itself is under $50.00 but the total cost will vary as to type of support and installation materials.

IV. Installation

The panel is supported in mid-stream at least 18 inches above the water with the angled baffles parallel to stream flow (Figure 2).

A vertical screen 3 feet high suspended over the downstream side of the panel is recommended to prevent larger fish from jumping onto the baffles (Figure 3).

A study by Flick (1968), in New York, comparing the effectiveness of panels with wooden slats parallel to stream flow, and angled baffles perpendicular and parallel to stream flow, indicated that only the latter design was fish-proof. Water fell through the wooden slats and perpendicular baffles in heavy sheets, creating a pool and submerged wave effect which aided fish movement (Figure 4).

The method of support of the panel and construction of a solid barrier behind and to the sides of the panel is optional.

V. Recommended Use

A fish barrier of this type could probably be modified for use on larger streams, but appears to be best suited for use on controlled or spring fed streams with relatively low flow (5 to 25 second-feet).

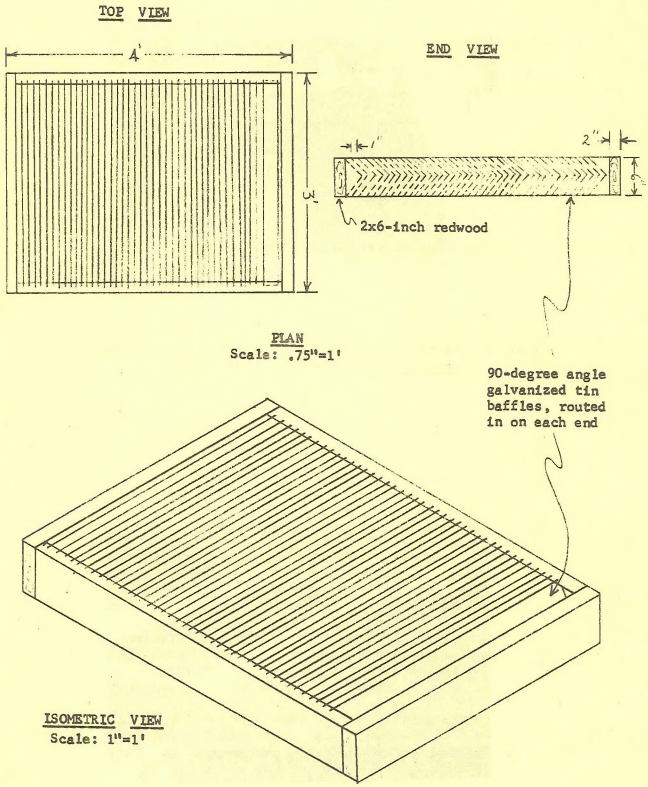


Figure 1. Barrier panel recommended specifications.

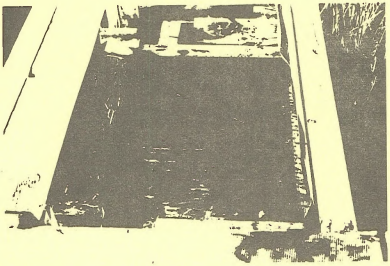


Figure 2. Barrier panel in mid-stream with angled baffles parallel to the flow.

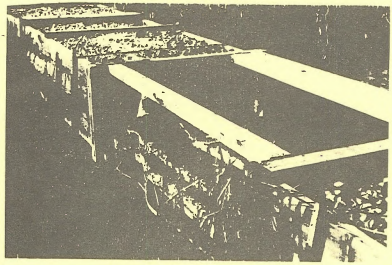
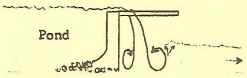
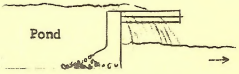


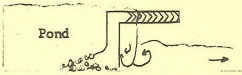
Figure 3. Completed structure with screen suspended on downstream side.



Type I. Wooden slats-
Water falls through in heavy sheets.



Type II. Angled baffles parallel to flow.-
Water dispersed through panel in thin sheet or film.



Type III. Angled baffles perpendicular to flow-
Water falls through in heavy sheets.

Figure 4. Elevation plan of three types of barrier panel (from Elick,1968).

Literature Cited

Flick, W.A. 1968. Effectiveness of Three Types of Barrier Panels in Preventing Upstream Migration of Fish. The Progressive Fish-Culturist. April, 1968: 100-103.

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Miller, R.R. and E.P. Pister. 1971. Management of the Owens Pupfish, Cyprinodon radiosus, in Mono County, California. Trans. Amer. Fisheries Soc. 100(3): 502-509.